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INTERNATIONAL EXHIBITIONS.

THEIR EFFECTS ON PROGRESS.

Views of Europeans and Americans of world-wide fame.

EXTRACT FROM "TIMBS' INTERNATIONAL EXHIBITION, 1862."

By Mr. Monckton Milnes, M. P., p. 64.

Upon the probable effects of this great display, the speaker observed:

"Large congregations of men had always visibly struck the imagination, and the Jubilee of Pope Boniface so occupied the mind of Dante, that he illustrates it by one of his supernatural pictures, and fixed it as the date of his spiritual journey. Such assemblies have always been looked on as a harbinger of peace, and we know what were the expectations of 1851. But though that hope has proved delusive, we may yet feel thankful that all the disturbances of the world have since that time been the conflicts of a lower against a higher civilization, in which the higher has had the mastery. The materials here brought together must impress on the spectators the mutual dependence of nations, and the interests of amity. One of the chief objects of interest would be the various applications of art to industry; advantages, perhaps, somewhat balanced by the injury of the application of industry to art. As art becomes mechanical it loses the spontaneous dignity which makes it most divine; and it seems impossible to diffuse and repeat it, without some diminution of its highest faculties. But this qualification does not extend to the relations between industry and science—there the moral is as certain as the material profit; intelligent labor is substituted for the mere

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exertion of brute strength; the supply of comfort is extended from the luxurious classes even to the necessitous; the diseases consequent on physical hardships are diminished and the average longevity of man increased. To the progress of scientific education not only the philosopher, but the statesman looks for the diffusion of public happiness and the permanence of modern civilization. *If the States that now rule the world are to escape the doom of Babylon and Rome, of Egypt and of Greece, it is in that they have not made their science the monopoly of a caste or priesthood, but have placed it more or less within the reach of the individual intelligence of the humblest citizen.* Let the education that enables mankind to apprehend and value truth proceed commensurately with the discoveries of science, and the community will gradually, but continuously, absorb into itself that knowledge which makes decay impossible; and our country may boldly and confidently meet whatever destiny remains for it in the inscrutable designs of the Creator and Ruler of the Universe."

EFFECT ON AMERICAN MANUFACTURES.

HOW THE REAPING MACHINES WERE INTRODUCED INTO EUROPE.

*Extract from "American Superiority at the World's Fair,"
by Charles T. Rodgers, p. 16.*

M'CORMICK'S REAPING AND MOWING MACHINES.

"Lord Ebrington, in giving the health of the foreign visitors present, remarked that it must have been truly gratifying to their American brethren present, to witness the triumphant and complete success of the American reaper, which had done its work under great disadvantage, to the satisfaction of all present; and the occasion was one of very deep interest. [Cheers.] He concluded with the health of Mr. Mechi, who responded in a straightforward speech that drew forth rounds of applause. In allusion to the Reaper, Mr. Mechi remarked that we had to-day received from our American brethren, descendants of this country, the American reaper, which had been entirely successful. It was a

fact worth remembering that they have sent here a reaping machine, that would *cut all the grain in England*. And this had been in operation in the United States seven years, and but for the great exhibition in progress would have yet remained unknown to the farmers in Great Britain. It was a boon of no ordinary value, and it was undoubtedly one of the most important improvements introduced into this country to cheapen the production of food.

"Other speeches were made, and the company separated after the labors of the day, well satisfied with the result of the trials made."

The reaper upon its second trial maintained its high supremacy.

WHAT INTERNATIONAL EXHIBITIONS TEACH.

By Horace Greeley, 1853-'54.

"The immediate practical uses of the exhibition will be largely dwelt upon by the usual exponents of public sentiment, by the journals, and by the occasional orators; but there are other aspects of it more important, perhaps, but not so likely to arrest attention. These we propose to notice.

"Let us premise, however, that we would not, by any means, overlook the more practical bearings of a display of this kind. As an epitome of the experiences of a traveler, who should pass his time in examining the workshops of the world, as a collection of the finest specimens of industrial art, as a record of the progress of human development in some of its most significant elements, as a tide-mark of the height of perfection to which mechanical processes have been carried, it cannot fail to be instructive.

"*It must be particularly instructive to Americans, because it will furnish them with evidence of a skill in many branches of creation beyond their own, and of models of workmanship which are superior precisely in those points in which their own are most deficient.* No one, we presume, will push his national predilections so far as to deny that, in the finer characteristics of manufacture and art, we have yet a vast deal to learn. Stupendous as our advances have been in railroads, steamboats, canals, printing-presses, hotels and

agricultural implements, rapidly as we are growing in excellence in a thousand departments of design and handicraft, astonishing as may be our achievements, under all the difficulties of an adverse national policy, adroit, ingenious and energetic as we have shown ourselves in those labors which have been demanded by the existing conditions of our society, we have yet few fabrics equal to those of Manchester, few wares equal to those of Birmingham and Sheffield, no silks like those of Lyons, no jewelry like that of Geneva, no shawls like those of the East, no mosaics like those of Italy. But, in our rapid physical improvements—growing, as we are, in prosperity, in population, in wealth, in luxuries of all kinds—these are the articles that we ought to have and must have, to give diversity to our industry, to relieve us from dependence upon other nations, to refine our taste, and to enable the ornamental and elegant appliances of our life to keep pace with our external development. Mere wealth, without the refinements of wealth—barbaric ostentation, prodigal display, extravagant self-indulgence—can only corrupt morals and degrade character. But the cultivation of the finer arts redeem society from its grossness, spreads an unconscious moderation and charm around it, softens the asperities of human intercourse, elevates our ideals, and imparts a sense of serene enjoyment to all social relations. Our common people, immeasurably superior to the common people of other nations in easy means of subsistence, in intelligence, as in sterling virtues, are yet almost as immeasurably behind them in polished and gentle manners, and the love of music, painting, statuary, and all the more refining social pleasures.

“These exhibitions, then, which make us acquainted with the superlative arts of other nations, cannot but be highly useful to us. But they have also another use—a moral, if not a religious use; in that they teach us so powerfully the dependence of nations upon each other—their mutual relations, and the absolute necessity of each to the comfortable existence of all the rest. There is hardly an article in the Crystal Palace to which the labor of all the world has not, in some sort, contributed; hardly a machine which is not an embodied record of the industrial progress of the world; hardly a fabric which, analyzed, does not carry us to the ends of the earth, or which does not connect us intimately with the people of every clime; with the miners, who tortured its raw material from the dark cave, or the diver, who

brought it from the bottom of the sea; with the solitary mariner who shielded it from the tempests; with the poor, toil-worn mechanic, who gave it form or color; or with the artist, who imparted to it its final finish. Thus, no man liveth to himself alone. Even in his most ordinary occupations, he is 'part and parcel of us, as we are of him. A wonderful and touching unity pervades the relations of the race; all men are useful to all men; and we who fancy that, in some important respects, we stand on the summit-level of humanity, have a deep interest in the laborers of the vales; in the celerity, the excellence, and the success of what they do, and in the comfort and happiness of their general condition. As Emerson has wisely sung, in that sweet poem of his—

‘All are needed by each one;
Nothing is fair or good alone.’ ”

[*Extract from “Art and Industry,” by Horace Greeley—1853-4, pages 49-51.*]

THE NATURE OF MODERN PROGRESS.

By Horace Greeley, 1853.

“Our progress, in these modern times, then, consists in this, that we have democratized the means and appliances of a higher life; that we have spread far and wide the civilizing influence of art; that we have brought, and are bringing more and more, the masses of the people up to the aristocratic standard of taste and enjoyment, and so diffusing the influence of splendor and grace over all minds. Grander powers have been infused into society. A larger variety and a richer flavor have been given to all our individual experiences; and, what is more, the barriers that once separated our race, the intervals of time and space that made almost every tribe and every family the enemy of every other tribe and family, have been annihilated, to enable the common interests and common enjoyments to renovate and warm us into amity of feeling and the friendly rivalry of fellow-workmen, pursuing, under different circumstances, the same great ends.

“Legislation, rightly directed, might have done, and may yet do, much for the civilization and advancement of society; but, unfortunately, in most nations of the earth, the legisla-

tion, having been under the exclusive control of a self-styled higher class, has impeded rather than hastened the movement. Yet, in the face of this terrible obstacle, under all the evils of the insular monopoly of Great Britain, seeking to aggrandize her own manufacturing industry at the expense of the industry of the rest of mankind, the genius of practical art has triumphed, and will triumph still more, over every difficulty. It is raising the laborer to his true position; it is facilitating the association of men; it is harmonizing their interests; and whether legislation helps it or not, it will ultimately redeem our race from dependence and slavery. And herein is the chief reason why we salute with satisfaction the opening of the Crystal Palace."—*July 14. Extract from "Art and Industry," 1853-4, by Horace Greeley, (pages 52-3.)*

Industrial Progress in England Resulting from the Exhibition of 1851, as Demonstrated by that of 1862.

Mr. William Hawes next communicated to the Society of Arts the interesting facts, to show in comparison the advantages in 1862 over those in 1851, which, though they do not belong exclusively to the exhibition, may be incidentally quoted here:

"That the exhibition fully realized the most sanguine anticipations in showing the state of development of the manufactures of all nations to 1851, and that it gave to the world a more thorough knowledge of the power, and better appreciation of the capabilities, of each nation, is universally admitted. It now remains for the exhibition of 1862 to show what has been the world's progress from the starting-point so clearly indicated in 1851, not only in the production of works of art, or in the increased beauty of certain manufactures; but in the practical applications of science, invention, and mechanical skill to improve and to cheapen the necessities of every-day life, and so to raise the social position, by adding to the comforts and enjoyments of the great bulk of the people."

Mr. Hawes then refers to the jealousy felt in 1851, respecting foreign manufactures, the injury to our home trade, &c., and especially to the alarm and distrust felt at the large

number of foreigners which would be brought into England to see the exhibition. The following are Mr. Hawes' results:

"The people are better employed, and their social and intellectual condition is improved. Crime, which for years previously to 1851 increased in a ratio beyond that of the population, is now happily decreasing. Railways have been extended from above 6,000 to above 10,000 miles. The Electric Telegraph has become universal, and in every direction facilities for communication have been increased.

"New industries have arisen. In fine art, painting and sculpture, it is hardly possible, except in very extraordinary periods, that a marked change can be observed in a single ten years, but this country certainly holds its own as compared with the productions of other countries.

"Photography, hardly known in 1851, has developed itself, and has become an important branch of art and industry, used alike by the artist, the engineer, the architect, the manufacturer, the merchant, and the magistrate. By it fleeting effects of nature are caught, and preserved for the use of the artist; the progress of works is daily recorded, for the information of the engineer; the finest tracery of ancient architecture preserved, in its exact proportions, for the architect; the manufacturer and merchant can transmit to, and receive from their most distant correspondents, exact representations of what they require to be imitated or produced; the soldier, sailor and civilian on foreign service finds in photographic likenesses, and the facility with which they are renewed, the means of retaining the fondest associations of home and country; and the criminal flying from justice is followed with means of instant identification. This is indeed an international application of art and industry.

"In the preparation of colors for printing and dyeing, most important discoveries have been made by our chemists, to whose researches the manufacturing industry of the country is greatly indebted. The recently-discovered and most beautiful and brilliant colors, called the 'Aniline' series, are produced from coal and its products, and the facility of their application is so great that a complete revolution is taking place in the processes of dyeing and printing.

"In the manufacture of glass great economy has been introduced; and the process just perfected of transferring photographs to glass, and permanently fixing them by the action

of fire, will add a new and beautiful style of ornamentation to our houses. The manufacture of agricultural implements, and especially the application of steam-power to them, has been so improved and extended, that it is now a highly important branch of trade; and the exhibition of the improvements which have been made in our spinning, weaving, and winding machinery will afford interesting evidence of our mechanical progress in these branches of industry.

“Marine telegraphy, only just accomplished in 1851—the public communication with Dublin having been opened in June, and that with Paris in November, 1852—has now become almost universal, linking together distant countries, and destined ere long to overcome the difficulties of separation by the ocean, be the distance ever so great. In the manufacture of iron, improvements have also been made—new bands of ore have been discovered; and day by day we are economizing its production, and a metal between iron and steel is now produced, at one process, which heretofore required two or more processes, alike expensive and difficult. In artificial light our sphere of production is enlarged and light is cheaper, whereby hours are now available for industrial pursuits, and for the acquisition of knowledge by large numbers, which were formerly either unemployed or wasted. In steam power, especially that applied to railroads and to ocean steam navigation, economical appliances have advances rapidly.

The use of coal for locomotives, in place of coke, and superheating steam and surface—condensing in ocean steamers, tends to increase the power and economize the cost of these powerful engines of civilization. In shipbuilding, the past ten years have produced great changes. Our navy and mercantile marine have alike advanced in scientific construction, and in mechanical arrangement. In the *great Eastern* we see the practical application for the first time of screw and paddle to the same ship; we have enormous strength in her cellular construction, and we have greater speed, with power smaller in proportion to her size than ever was before attained. In the construction of our *Warrior* and *Black Prince*, and other iron-plated ships, we have a combination of wood and iron by which our ships of war may almost bid defiance to whatever may be brought against them; being, both in size and power far beyond anything which was contemplated in 1851; and machinery is now being constructed, having its origin in the block machinery

at Portsmouth, by which the wood work required for large large boats will be so accurately prepared that they will be put together in a few hours.

"In printing great advances have been made. By the perfection of chromatic printing, views of distant countries, copies of celebrated pictures, most beautifully colored, have been brought within the reach of almost every class, displacing pictures which neither improved the taste nor gave useful information; and by the application of most expensive and most beautiful machinery to the printing of our daily journals, we have been enabled profitably to meet the increased demand caused by the cheapness of our newspapers. Invention and mechanical contrivance have thus kept pace with the requirements of intellect and the daily-increasing love of knowledge; and, to crown all, the gold discoveries in Australia, but just known in 1851, and following those in California in 1849, have supplied a medium of exchange when it appeared almost indispensable to the full realization of the advantages springing out of the great impetus given to industry during the past ten years.

"But there are two branches of Industry not to be overlooked, which did not exist in 1851. The manufacture of Arms of precision, and the voluntary organization of skilled labor to use them, both of which may, at first sight, appear antagonistic to the progress of art, manufactures and commerce, but are, in fact, their great protectors. War, a remnant of barbarism, must, fortunately, be infinitely more difficult, hazardous, and expensive, not only in the preparations for it, but in its results, when arms are constructed of such power that hardly any fortification or ship can resist them. Fortifications and naval architecture now wear a different complexion to what they did before 1851. The manufacture of the Whitworth rifle, and the Armstrong gun, are new industries since 1851. The small gun, directed by high intelligence, throwing a large and destructive missile to a distance beyond any previous belief, becomes a more formidable instrument of warfare than the large forces of olden time, directed only by low intelligence, and relying upon brute force for success; and in the perfection of these implements of war, costly though they be, we are as a nation deeply interested; for in so far as we are in advance of all the world in their manufacture, and in our knowledge of how to use them, so are we safe from foreign interference. The better armed will rarely be attacked, and still more rarely successfully so, by the worse armed."

It will be seen that Mr. Hawes' anticipations as regards our colonies, have been realized in a remarkable degree :

"The effect of the progress we have made since 1851, is also shown by the rapid *increase of our colonial and foreign trades*, and the much greater interest which foreigners now take in England and English manufactures. Then, after a period of great agricultural and commercial distress, we exported but 65,000,000 *l.* per annum, now we export 136,000,000 *l.* Then India, governed by a separate authority, did not afford facilities for emigration, or to settlements being made by English capitalists. Now that vast dependency, entirely under the government of our Queen, intersected by railways and new roads, and with steamboats traversing her rivers, will become, year by year, more intimately acquainted with, and larger consumers of, our manufactures."—*Extract from "Timbs' International Exhibition of 1862," page 17.*

RESULTS OF THE LONDON EXHIBITION OF 1851 —IMPORTANT REVELATIONS.

By Dr. Lyon Playfair, C. B., F. R. S., January 7, 1852.

"I have shown in my former lecture that a rapid transition is taking place in industry; that the raw material, formerly our capital advantage over other nations, is gradually being equalized in price, and made available to all by the improvements in locomotion; and that industry must in future be supported, not by a competition of local advantages, *but by a competition of intellect.* All European nations, except England, have recognized this fact; their thinking men have proclaimed it; *their governments have adopted it as a principle of State;* and every town has now its schools, in which are taught the scientific principles involved in manufactures, while each metropolis rejoices in an industrial university, teaching how to use the alphabet of science in reading manufactures aright. Were there any effects observed in the exhibition from this intellectual training of their industrial populations? The official reserve necessarily imposed upon me as the commissioner appointed to aid the juries need exist no longer, and, from my personal conviction, *I answer without qualification in the affirmative.* The result of the exhi-

bition was one that England may well be startled at. Where ever, and that implies in almost every manufacture, science or art was involved as an element of progress, we saw, as an inevitable law, that the nation which most cultivated them was in the ascendant. Our manufacturers were justly astonished at seeing most of the foreign countries rapidly approaching and sometimes excelling us in manufactures, our own by hereditary and traditional right. Though certainly very superior in our common cutlery, we could not claim decided superiority in that applied to surgical instruments, and were beaten in some kinds of edge-tools. Neither our swords nor our guns were left with an unquestioned victory. In our plate-glass, my own opinion, and I am sure that of many others, is, that if we were not beaten by Belgium, we certainly were by France. In flint glass our ancient *prestige* was left very doubtful, and the only important discoveries in this manufacture were not those shown on the English side. Belgium, which has deprived us of so much of our American trade in woolen manufactures, found herself approached by competitors hitherto almost unknown, for Russia had risen to eminence in this branch, and the German woollens did not shame their birthplace. In silversmith work we had introduced a large number of foreign workmen as modelers and designers, but nevertheless we met with worthy competitors. In calico-printing and paper-staining our designs looked wonderfully French, whilst our colors, though generally as brilliant in themselves, did not appear to nearly so much advantage, from a want of harmony in their arrangement. In earthenware we were masters, as of old, but in china and in porcelain, our general excellence was stoutly denied, although individual excellencies were very apparent. In hardware we maintained our superiority, but were manifestly surprised at the rapid advances making by many other nations. Do not let us nourish our national vanity by fondly congratulating ourselves that as, on the whole, we were successful, we had little to fear. I believe this is not the opinion of most candid and intelligent observers.

It is a grave matter for reflection, whether the exhibition did not show very clearly and distinctly that the rate of industrial advance of many European nations, even of those who were obviously in our rear, was at a greater rate than our own; and if it were so, as I believe it to have been, it does not require much acumen to perceive that in a long

race the fastest sailing ships will win, even though they are for a time behind. The exhibition will have produced infinite good, if we are compelled as a nation to acknowledge this truth. The Roman empire fell rapidly, because, nourishing its national vanity, it refused the lessons of defeat, and construed them into victories. All the visitors, both foreign and British, were agreed upon one point, that, whichever might be the first of the exhibiting nations, regarding which there were many opinions, that certainly our great rival, France, was the second.

Let us hope that in this there is no historical parallel. After the battle of Salamis the generals, though claiming for each other the first consideration as to generalship, unanimously admitted that Themistocles deserved the second; and the world, ever since, as Smith remarks, has accepted this as a proof that Themistocles was, beyond all question, the first general. Let us acknowledge our defeats when they are real, and our English character and energy will make them victories on another occasion.

But our great danger is, that in our national vanity, we should exult in our conquests, forgetting our defeats; though I have much confidence that the truthfulness of our nation will save us from this peril.

A competition in industry must, in an advanced stage of civilization, be a competition of intellect. The influence of capital may purchase you for a time foreign talent. Our Manchester calico-printers may, and do, keep foreign designers in France at liberal salaries. Our glass-works may, and do, buy foreign science to aid them in their management. Our potteries may, and do, use foreign talent both in management and design. Our silversmiths and diamond-setters may, and do, depend much upon foreign talent in art and foreign skill in execution; *but, is all this not a suicidal policy, which must have a termination, not for the individual manufacturer, who wisely buys the talent wherever he can get it, but for the nation, which, careless of the education of her sons, sends our capital abroad as a premium to that intellectual progress which, in our present apathy is our greatest danger?*

IMPERISHABLE EFFECTS OF INTERNATIONAL EXHIBITIONS.

“Do not dream of that exhibition as a thing of the past; rather think of it as a glorious emblem of the future. When Nep-

tune and Minerva disputed as to who should name the capital of Cecropia, the gods resolved that the right should be given to the one who granted to man the greatest benefit. Neptune struck with his trident the earth, whence sprung a war-horse, while Minerva produced an olive tree. England, though sharing with Neptune the empire of the sea, ratified the decision of the gods by rearing the emblem of peace. The exhibition has been an olive tree, the branches of which have now been spread among all nations, and success for the future will depend upon the care and wisdom with which they are tended, so as to grow into goodly trees. Do not let us by severing industry from science, like a tree from its roots, have the unhappiness of seeing our goodly stem wither and perish by a premature decay; but, as the tree itself stretches out its arms to heaven to pray for food, let us, in all humility, ask God also to give us that knowledge of His works which will enable us to use them in promoting the comfort and happiness of His creatures. Our duties in this respect are clearly indicated in the motto of our catalogue." [Extract from "*The General Bearing of the Great Exhibition*," by Dr. Whewell, pages 205-8.]

AMERICAN PRODUCTS AT THE LONDON "WORLD'S FAIR" OF 1851.

Daniel Webster on National Prowess.

Extract from a speech made by the great expounder of the Constitution, at the Boston Railroad Jubilee, September 17, 1851:

"Why, sir, the bitterest, the ablest, the most anti-American press in all Europe [London Times], within a fortnight, has stated that in every thing valuable, in every thing that is for human improvement, the United States go so far ahead of everybody else as to have nobody else in sight. It is like the position of Jove among the gods:—Jove is first, and there is no second; and in another paper, influential in the councils of Great Britain, the editor says: 'The time may come—he might also have said, and *now is*—when America shall command the ocean, and both oceans, and *all* oceans.' This results partly from the skill of individuals and partly from the untiring ingenuity of the people, and partly from those great events which have given us the ocean

of one world on one side and the ocean of the other world on the other. They appear to have filled the minds of the people with astonishment, and it brought to my mind a story told of a gentleman not now living. It was related to Mr. John Lowell, about thirty years ago, returning to Europe after the peace of 1815. The gentleman to whom I have referred was spoken to, by some one of the great personages of Europe, who, alluding to the naval power of the United States, said that he hoped the European powers would now be permitted to traverse the ocean quietly, and the response was 'Yes, with our leave.' (Applause.)

AMERICAN PRODUCTS AT THE LONDON EXHIBITION OF 1851.

Sir Henry L. Bulwer's Tribute to American Genius.

"Notwithstanding the very inadequate representation of American industry at the World's Fair, the ingenuity of our countrymen commanded general admiration. At a dinner given to the American exhibitors, by George Peabody, the eminent American banker, in London, Sir Henry L. Bulwer (the English Minister at Washington) paid the following compliment to our nation :

"The idea of this Great Exhibition, an idea for which we are indebted to that eminent and illustrious prince, who adds to his many other merits that of understanding the epoch in which he lives, and the country with which he is connected—the idea of this great exhibition, I say, was not, if I understand it rightly, merely that of bringing together the chairs and tables, the tapestry and jewelry, the works of art and machinery ; but to collect, as it were, in one focus, the mind of the whole world, so that each nation might learn and appreciate the character and intelligence of the other ; and, if this be so, what is the place that men will assign, after receiving your productions, to the character and intelligence, that is to say, to the mind, of America ? Why, gentlemen, they will say that, for all manly and practical purposes, its place is about the head of the poll. [Cheers.] Where, out of America, shall we get a pistol like Mr. Colt's, to kill our eight enemies in a second ; or a reaping machine like Mr. McCormick's, to clear out twenty acres of wheat in a day ; or locks like those of Mr. Hobbs, which appear, after

all, the only ones to which we can safely confide our secrets or our treasures? Nor is this all, gentlemen. Go a little further, and we shall find a graceful and melancholy figure, which, while it fitly represents the charms and misfortunes of ancient Greece, exhibits at the same time the pre-eminent powers of sculpture, and the pre-eminent genius of Powers. [Great cheering.] And, gentlemen, whilst we are thus passing in review the productions in Hyde Park, what is that small speck that I see lightly skimming along the sea? I think I recognize an old acquaintance; and sure enough, on the very day that I landed at Liverpool, I learned that little vessel which I had seen but lately, sleeping quietly in the waters of New York, had, after gallantly crossing the great Atlantic, given the go-by to the whole of our yacht squadron; and this, too, in our own waters, and before the very eyes of the sovereign whom we are proud enough to call the Queen of the Ocean."—[*Extracted from "American Superiority at the World's Fair of 1851, by Charles T. Rogers."*]

THE POETRY OF INDUSTRY.

Lectures on the Results of the Great Exhibition of 1851, by Dr. Whewell.

"The *Poet*, as the Greeks called him, was the *Maker*, as our English fathers also were wont to call him. And man's power of making may show itself not only in the beautiful *texture* of language, the grand machinery of the epic, the sublime display of poetical *imagery*, but in those material works which supply the originals, from which are taken the derivative terms which I have just been compelled to use; in the textures of soft wood or fine linen or glossy silk, where the fancy disports itself in wreaths of visible flowers; in the machinery mighty as the thunderbolt to rend the oak, or light as the breath of air which carries the flower dust to its appointed place; in the images which express to the eye beauty and dignity, as the poet's verse does to the mind; so that it is difficult to say whether Homer or Phidias be more truly a poet. That mighty building, then, along the aisles of which we have wandered day after day for months, full as it was of the works of man, contained also the works of many who were truly Makers; who stamped upon matter

and the combinations of matter that significance and efficacy which makes it a true exponent of the inward activity of man.

The objects there, the symbols, instruments and manifestations of beauty and power were utterances, articulate utterances, of the human mind, no less than if they had been audible words and melodious sentences. There were expressed in the ranks of that great display many beautiful and powerful thoughts of gifted men of our own and other lands. The Crystal Palace was the cabinet in which were contained a vast multitude of compositions—not of words, but of things which we, who wandered along its corridors and galleries, might con, day by day, so as to possess ourselves, in some measure and according to our ability of their meaning, power and spirit. And now, that season of the perusal of such a collection of works being past, those days of wonderment at the creation of such a poetry being gone by, the office of reading and enjoying being over, the time for criticism seems to have arrived. We must now consider what it is that we have admired, and why; must try to analyze the works which we have thus gazed upon, and to discover the principles of their excellence.

As the critic of literary art endeavors to discern the laws of man's nature, by which he can produce that which is beautiful and powerful, operating through the medium of language, so the critic of such art as we have had here presented to us—of material art, as we may term it—endeavors to discern the laws of material nature; to learn how man can act by these, operating through the medium of matter, and thus produce beauty, and utility, and power. This kind of criticism appears to be the natural and proper sequel to such a great burst of production and exhibition, as we have had to witness, to discover what the laws of operative power are, after having had so great a manifestation of what they do.

For we see that, in general, art has preceded science. Men have executed great, and curious, and beautiful works before they had a scientific insight into the principles on which the success of their labors was founded. There were good artificers in brass and iron before the principles of the chemistry of metals were known; there was wine among men before there was a philosophy of vinous fermentation; there were mighty masses raised into the air, cyclopean walls and cromlechs, obelisks and pyramids—probably gi

gantic doric pillars and entablatures—before there was a theory of the mechanical powers. The earlier generations did; the later explained that it had been possible to do so. Art was the mother of science; the vigorous and comely mother of a daughter of far loftier and serener beauty, and as it had been in the period of scientific activity in the ancient world so was it again in the modern period, in which science began her later growth.

INDUSTRIES AND ARTS OF THE MIDDLE AGES.

The middle ages produced or improved a vast body of arts. Parchment and paper, printing and engraving, glass and steel, compass and gunpowder, clocks and watches, microscopes and telescopes, not to speak of the marvels of architecture, sculpture, and painting, all had their origin and progress while the sciences of recent times were in their cradle or were unborn. The dawn of the sixteenth century presented, as it were, a great exhibition of the works which men had been producing from the time of the downfall of Roman civilization and skill. There, too, might be seen by him who travelled from land to land, beautiful textures, beautiful vessels of gold and bronze, of porcelain and glass, wonderful machines, mighty fabrics; and from that time, stimulated by the sight of such a mass of the works of human skill, stimulated still more by the natural working of those powers of man from which such skill had arisen; men were led to seek for science as well as art; for science as the natural complement of art, and fulfilment of the thoughts and hopes which art excites; for science as the fully developed blossom of which art is the wonderfully involved bud. Stimulated by such influences, the scientific tendencies of modern Europe took their starting impulse from the great exhibition of the productions of the middle ages which had accumulated in the sixteenth century; and have ever since been working onwards, ever increasing vigour and in an ever-expanding sphere.

THE SCIENTIFIC MORAL.

As the successful scientific speculations of the last three centuries have been the natural sequel to the art energies of the preceding ages, so must the newest scientific speculations of our contemporaries and their successors, in order to be successful, be the result and consequence of the powers,

as yet often appearing in the undeveloped form of art alone, which exist among us at the present day. And thus a great spectacle of the works of natural art ought to carry with it its scientific moral.

And the opportunities which we have lately had of surveying the whole of the world in which art reigns, and of appreciating the results of its sway, may well be deemed too valuable to be let slip for the purposes of that scientific speculation which is the proper sequence of such occasions. So it has seemed to those who have from the beginning taken a lofty, and comprehensive, and hopeful view of the great undertaking of which the first act is now completed; and especially to that mind which has always taken *the most* lofty, and comprehensive, and hopeful view."

CHEMICAL AND PHARMACEUTICAL PROCESSES.

Jacob Bell, Esq., M. P., December 17, 1851

"I think I have said enough to show the great exhibition has acted as a stimulus to those who are commercially engaged in the application of chemistry to practical purposes. There is another class of men on whom it was calculated to exert an influence of rather a different description. I allude to those who study the abstract science of chemistry philosophically, with a view of extending the general stock of knowledge. Such men do not require the stimulus of a great exhibition; their stimulus is the pleasure they feel at each step of their progress in the development of science, the evidence which they see of the wisdom displayed in the adaptation of the materials of which this earth is composed to the purposes for which they are intended. But these researches, if carried on with a vague, undefined thirst for discovery, are less likely to be attended with a really useful result than they would be if directed to some practical object. Communication between the philosophical chemist and the chemical manufacturer is, therefore, desirable; the opportunity for such communication was afforded by the great exhibition, which also tended in other respects to promote the general extension and diffusion of knowledge. Persons engaged in the same pursuits in the different parts of the world met and compares notes, exchanged information, and in many instances laid the foundation for future correspondence."

PROGRESS OF ART-MANUFACTURES EXEMPLIFIED IN THE LONDON EXHIBITION OF 1862.

"The English display of industrial art was larger and more miscellaneous than that of France. There was vulgarity enough in the English department to send us home sorrowing, and there was progress enough to cheer us in our most desponding moments.

"The artist has clearly had to do with the producer during the last eleven years. His influence has often been thwarted, and his suggestions altered, but still he has been employed as he never used to be. * * * For this development much credit is due to the schools of design, which are at work in various places, but much also to the impulsion given by persons who have taught without a pencil in their hands, and whose lessons may be summed up in the one axiom, to seek utility of form and reality of material first, and then to ornament in accordance with that form and that material. In the present exhibition the furniture, whether of the costly or the cheap description, paper hangings and carpets, testified respectively to this upward tendency. Glass-painting alone was standing still, so far as we could judge by the exhibition."—[*Extract from "The International Exhibition of 1862," by John Timbs.*]

MODERN INDUSTRIAL PROGRESS COMPARED WITH ANCIENT AND ORIENTAL INDUSTRY.

By Dr. Whewell, F. R. S., &c., pp. 15 to 20.

Extract from "The General Bearing of the Great Exhibition of 1851."

"Now, that which this scientific dream thus presents to us in imagination, the exhibition of the industry and arts of all nations, has presented as a visible reality, for we have had there collected examples of the food and clothing and other works of art of nations in every stage of the progress of art. From Otaheite, so long in the eyes of Englishmen the type of gentle but uncultured life, Queen Pomare sends mats and cloth, head-dresses and female gear, which the native art of her women fabricates from their indigenous

plants. From Labuan, the last specimen of savage life with which this country has become connected, we have also clothes and armour, weapons and musical instruments. From all the wide domains which lie within or around our Indian empire, we have rich and various contributions—from Singapore and Ceylon, Celebes and Java, Mengatal and Palembang. The ruder and more primitive of these regions send us their native food and clothing, their fishing-nets and baskets; but art soon goes beyond these first essays. From Sumatra we have the loom and the plough, lacquered work and silken wares; and, as we proceed from these outside regions to that central and ancient India, so long the field of a peculiar form of civilization, we have endless and innumerable treasures of skill and ingenuity, of magnificence and beauty. And yet we perceive that, in advancing from these to the productions of our own form of civilization, which has, even in that country, shown its greater power, we advance also to a more skillful, powerful and comprehensive and progressive form of art.

“And looking at the whole of this spectacle of the arts of life in all their successive stages, there is one train of reflection which cannot fail, I think, to strike us, namely this:

“In the first place, that man is, by nature and universally an artificer, an artisan, an artist. We call the nations from which such specimens come as those which I first mentioned, rude and savage, and yet how much is there of ingenuity, of invention, of practical knowledge of the properties of branch and leaf, of vegetable texture and fiber, in the works of the rudest tribes. How much, again, of manual dexterity, acquired by long and persevering practice, and even so, not easy.

“And then, again, not only how well adapted are these works of art to the mere needs of life, but how much of neatness, of prettiness, even of beauty, do they often possess, even when the work of savage hands. So that man is naturally, as I have said, not only an artificer, but an artist. Even we, while we look down from our lofty summit of civilized and mechanically-aided skill upon the infancy of art, may often learn from them lessons of taste. So wonderfully and effectually has Providence planted in man the impulse which urges him on to his destination, his destination which is, to mould the bounty of nature into such forms as utility demands, and to show at every step that with mere utility he cannot be content. And when we come to the

higher stages of cultured art—to the works of nations long civilized, though inferior to ourselves, it may be, in progressive civilization and mechanical power, how much do we find in their works which we must admire, which we might envy, which, indeed, might drive us to despair. Even still, the tissues and ornamental works of Persia and of India have beauties which we, with all our appliances and means, cannot surpass. The gorgereous east showers its barbaric pearl and gold into its magnificent textures.

“But is there really anything *barbaric* in the skill and taste which they display? Does the oriental prince or monarch, even if he confine his magnificence to native manufactures, present himself to the eyes of his slaves in a less splendid or less elegant attire than the nobles or sovereigns of this our western world, more highly civilized as we nevertheless deem it? Few persons, I think, would answer in the affirmative. The silks and shawls, the embroidery and jewelry, the moulding and carving, which those countries can produce, and which decorate their palaces and their dwellers in palaces, are even now such as we cannot excel. *Oriental* magnificence is still a proverbial mode of describing a degree of splendor and artistical richness which is not found among ourselves.

“What, then, shall we say of ourselves? Wherein is our superiority? In what do we see the effect, the realization of that more advanced stage of art which we conceive ourselves to have obtained? What advantage do we derive from the immense accumulated resources of skill and capital, of mechanical ingenuity and mechanical power, which we possess?

“Surely our imagined superiority is not all imaginary; surely we really are more advanced than they, and this term ‘advanced’ has a meaning; surely that mighty thought of a *progress* in the life of nations is not an empty dream; and surely our progress has carried us beyond them. Where, then, is the import of the idea in this case?

“What is the leading and characteristic difference between them and us, as to this matter? What is the broad and predominant distinction between the arts of nations rich, but in a condition of nearly stationary civilization, like oriental nations and nations which have felt the full influence of *progress* like ourselves.

“If I am not mistaken, the difference may be briefly expressed thus: That in those countries the arts are mainly

exercised to gratify the tastes of the few; with us, to supply the wants of many.

There, the wealth of a province is absorbed in the dress of a mighty warrior; here the gigantic weapons of the peaceful potentate are used to provide clothing for the world. For that which makes it suitable that machinery, constructed on a vast scale, and embodying enormous capital, should be used in manufacture, is that the wares produced should be very great in quantity, so that the smallest advantage in the power of working being multiplied a million fold, shall turn the scale of profit. And thus such machinery is applied when wares are manufactured for a vast population—when millions upon millions have to be clothed, or fed, or ornamented, or pleased with the thing so produced. I have heard one say, who had extensively and carefully studied the manufacturing establishments of this country, that when he began his survey he expected to find the most subtle and refined machinery applied to the most delicate and beautiful kind of work—to gold and silver jewels and embroidery: but that when he came to examine, he found that these works were mainly executed by hand, and that the most exquisite, and the most expensive machinery was brought into play where operations on the most common materials were to be performed, because these were to be executed on the widest scale. And this is where coarse and ordinary wares are manufactured for the many. This, therefore, is the meaning of the vast and astonishing prevalence of machine work in this country. That the machine with its million fingers works for millions of purchasers, while in remote countries, where magnificence and savagery stand side by side, tens of thousands work for one. There art labors for the rich alone; here she works for the poor no less. There the multitude produce only to give splendor and grace to the despot or the warrior whose slaves they are, and whom they enrich; here the man who is powerful in the weapons of peace, capital and machinery, uses them to give comfort and enjoyment to the public, whose servant he is, and thus become rich while he enriches others with his goods. If this be truly the relation between the condition of the arts of life in this country, and in those others may we not with reason and with gratitude say that we have, indeed, reached a point beyond theirs in the social progress of nations?

“THE INTERNATIONAL EXHIBITION OF 1862.”

“Science is every day pouring its hard-won treasures into the lap of art; new processes; new minerals; new dyes; new easements of manual operation; the galvanic bath turning the artist’s own clay into the everlasting statue; the sun slaving in the glass-house to paint man’s pictures; the electric spark running along the wires to tell man’s messages; the vapor of water doing that which no horses and no hands, no winds and no tides, could ever accomplish.

These agencies are Providence’s instruments to work out results mightier than any exhibition can make or mar. Yet exhibitions have their value, as seats by the road-side, where the wayfarers may rest and compare their adventures.

Much varied lore may there be gathered by those who will have the patience to sit at the feet of experience and industry, and many false impressions will be dispelled by the attrition of equal minds. Officials may have done their little best to spoil the good result, but, after every abatement has been made, great gratification to multitudes, tangible instruction to a smaller but numerous class will be the gross result of the Exhibition of 1862, as was of that in 1851. Whether there will ever be another in England, or whether there will not, these two will have left their mark on history. The names of the commissioners and of the engineer will be forgotten, while the date of both will be remembered as occurring in the reign of Queen Victoria, and as having been among the many wise conceptions for the public good of that Prince who had so eminently the capacity of swaying events by his consciousness of quiet power.”
[Extract from an article in the Quarterly Review, cited in “The International Exhibition of 1862,” by John Timbs, (page 74.)

IMPORTANCE OF INDUSTRIAL INSTRUCTION AS
 DEMONSTRATED AT THE LONDON WORLD’S
 FAIR.

“Know thyself” is an injunction more important even to nations than to individuals: Obedience to it lies at the very foundation of improvement; and how can a nation know itself and the state of its arts and manufactures, without

that opportunity of comparison afforded only by international exhibitions?

The following extracts enforce this idea, and suggest the only means of successful competition with other nations in the progress of industry; the elevation and refinement of labor, when our deficiencies shall have been clearly ascertained and set forth :

Then, indeed, America may supplement the wonderful inventive power and the marvelous enterprise of her people by that unlimited diversification of industry, and that perfection in methods and process, and in the application of science and art to manufactures which will make her independence complete under all emergencies, and which will constantly increase her exports.

SECOND REPORT OF THE COMMISSIONERS FOR THE EXHIBITION OF 1851.

"Institutions for industrial instruction exist in most of the Continental States, and have been growing in increased development during the last fifteen years. The marked increase in continental production has been partly ascribed to the knowledge of natural forces communicated to those engaged in industry by these institutions. In countries in which fuel and the materials of machinery either did not exist, or were not abundant, it was natural to depend more upon the intellectual element of production than in this country, where abundance gave an impulse to their labor and created much practical experience. It has long been a principle of foreign States that the application of science and art to production would more than balance a greater cheapness in raw material; and that the increased facilities in locomotion rendered the latter of less value as an element of manufacture, while it enabled the experience of other nations to be more readily acquired, and consequently would, in process of time, convert industrial competition into one involving the most economical application of natural forces. We beg to refer to extracts (see Appendix E) from a lecture by Doctor Playfair, who has recently visited many institutions for industrial instruction abroad, and who describes them as being, generally, in a high state of efficiency. The best proof of their utility to production is, that there is a constantly increasing demand, by those engaged in industry,

for the pupils reared at them; and, as a consequence of this, it is found that the number of pupils is everywhere augmenting. It is calculated that in Germany alone 13,000 men annually receive the high technical and and scientific training of the trade-schools and polytechnic institutions; while more than 30,000 workmen are being systematically taught the elements of science and of art, in schools which communicate instruction to them in their leisure hours.

"Besides the trade-schools, which are now scattered throughout Germany, there are important institutions, equivalent to industrial universities, in the capitals of nearly all the German States.

"Their systems of instruction have certain variations; but they are all agreed upon the general principle that their object is to teach the principles of science and art, upon which production depends, explaining fully the variations and nature of technical processes, but leaving them afterwards to be practically learned in the workshop or the factory. They rather teach a pupil how to be an intelligent manufacturer, than profess to make him one at the institution. Elementary knowledge in science is rarely given at these higher schools, as the pupil who enters them must previously possess it, the courses of instruction there being devoted to the application of that knowledge. So essential to the progress of industry are these technical colleges considered, that even small States, such as the Grand Duchy of Baden, support them at great expense. Thus the institution at Carlsruhe, situated in a large and commodious building, with every appliance of museums, laboratories and workshops, teaches 330 pupils, with the aid of no less than 41 professors and teachers. In France the *Ecole Centrale des Arts et Manufactures*, a private institution, raised by private capital, which has found and continues to receive the most ample remuneration in its success, annually educates 300 pupils in the highest branches of applied science and art, while its influence on industry has been found so important that the Government and the Councils-General of twenty-nine departments of France have established exhibitions (scholarships) in connection with it, in order to educate poor persons of extraordinary talent. The pupils of this establishment find immediate employment on leaving the school, and already about 500 of them are known to be holding stations of much importance in almost all parts of the world. The school is now found to be too small for the

demands of French industry, and its enlargement is under contemplation. We must, however, simply refer* to the extracts from Dr. Playfair's lecture for further information on the industrial institutions of other countries, both as regards the instruction of the middle classes and of artisans, remarking that the evidences of the increase in the number of the pupils, as well as the readiness with which they obtain employment, would afford sufficient proof of their influence upon industry, were there no other direct testimony to the important influence which they are exercising on the rapid development of production in foreign States." [*Extract from "The Second Report of the Commissioners for the Exhibition of 1851," pages 12, 13.*]

Extract from "A Lecture by Dr. Lyon Playfair, on Industrial Instruction on the Continent."

"The appreciation of its importance to France may best be seen in the Report of the Commission of the Chamber of Deputies appointed to inquire into the budget :

"You know, gentlemen, this useful establishment, founded in 1829, by the association of eminent professors, with the intention of forming civil engineers, the directors of work, the chiefs of workshops and factories.

"This private institution, which by its importance rivals in excellence our first public establishments, has created and put in practice a complete system of industrial education. It is at the same time a supplement to our polytechnic school and an addition to our various applied schools. Such an institution ministers to one of the first necessities of the age, therefore its success is complete. This is confirmed both by the unanimous opinion of the first manufacturers of the country and by the ease with which all the pupils educated at it have received employment.

"The school possesses 40 professors and teachers, and 300 students, each of whom pay £36 annually. The number of the latter is only limited by the size of the building, and it is in contemplation to remove to one considerably larger. The courses extend over three years, and are compulsory on all; but in the second year the practical operations divide into two parts, the one general, and the one applicable to one of the four following specialties : (A) Machinists, (B) Engineers,

(C) Metallurgists, (D) Chemists. Students are not admitted until they are eighteen years of age, and they must furnish proof of possessing a good elementary knowledge of the sciences." [*Extracts from "A Lecture, by Dr. Playfair, on Industrial Institutions on the Continent," page 67.*]

Extracts from "A Lecture of Dr. Lyon Playfair on Industrial Instruction on the Continent."

"Besides this institution, which is devoted to the industrial instruction of the middle classes, you all know of that princely establishment, the *Conservatoire des Arts et Metiers*, the object of which is, both by its splendid museums and by the lectures of the eminent men who profess there—and of whom it is only necessary to mention the names of Morin, Dupin, Pouillet, Peligot, Moll, Blanqui, Wolowski, Regnault, and Payen—to instruct the working classes in industrial science, and to draw public attention to all new discoveries in industry.

This institution is, however, so well known by its beautiful and instructive collections, that I am spared the necessity of describing them.

Under Colonel Morin, the distinguished director who has introduced such life and activity into the *Conservatoire* during the last few years, there are three provincial industrial colleges, each supported by government at an expense of 300,000 francs, or £12,000. These colleges are situated at Chalons, Augers, and Aix, and contain between 200 and 300 students each, *who are boarded and educated at the public expense*. The students are of a lower class than those who go to the *Ecole Centrale*, and are educated chiefly as men who may aspire to be master workmen. Accordingly, five hours every day are devoted to study and seven hours to the workshops. Many of the pupils of these institutions obtain government employment, and those who have passed their examinations find ready occupations as foremen, draughtsmen, and clerks of works. I have not personally seen these provincial schools, but in conversation with Colonel Morin, the present director, I have been assured of their high state of efficiency."—[*Extracts from "A Lecture by Dr. Playfair on Industrial Instruction on the Continent," page 68.*]

"Before concluding, it may be useful to draw attention to



some general points of interest in the systems of instruction which we have examined. In all of them there are differences with regard to the mode of giving instruction, but they are almost uniform in the feeling that the object of industrial schools is only to teach a pupil how to become an intelligent manufacturer, without attempting to make him one.

"They content themselves with communicating to him a knowledge of the principles upon which his technical art depends, but for its practice he must go to the workshops of industry. Some of the institutions, as, for example, the 'Trade Institute of Berlin,' endeavored at one time to teach practice in workshops attached to the institution; but this plan, as might have been anticipated, was found to be of little advantage, and it is now abandoned by most all the schools, only one or two being still found hovering on the outskirts of this error. In addition to the folly of attempting to teach the practice of an art within the confines of an institution chiefly devoted to other objects, it was found to be highly detrimental to the progress of the students, who were glad to escape from the mental labor of the classes to the muscular labor of the workshops." (Page 69.)

"The promoters of industrial instruction do not, therefore, offer it as a substitute for practical training, but consider it to be a means by which the latter can be made more efficacious. They do not think that the seed will grow unless the land is well tilled by the practical farmer, but they offer to manure the land first, and the plowing-in the manure will enrich the soil and render it more productive.

"The mere fact that industrial schools are increasing abroad, and that the number of their pupils is constantly augmenting, is of itself a sufficient proof of their influence on industry, even had we no proofs more direct than these. *But it is indeed extraordinary that the proofs are already so palpable, for it might have been expected that at least the time of one generation would have been required to develop their effects.*

"The interests of a nation extend much beyond the interests of the one generation which forms its present population, and the statesman will feel sure that the effects already in action will operate with a much increasing power in the future. (Page 70.)

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